PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PC472CF	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/14704	International filing date *(day/month/year)* 22.12.2003	Priority date *(day/month/year)* 20.12.2002
International Patent Classification (IPC) or both national classification and IPC F16D65/14, F16D65/00		
Applicant AKTIEBOLAGET SKF et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
19.07.2004	23.03.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Van Koten, G Telephone No. +49 89 2399-2954

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/14704

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

2-5, 7	as originally filed
1, 6	received on 23.12.2004 with letter of 21.12.2004

Claims, Numbers

6 (part), 7-11	as originally filed
1-5, 6 (part)	received on 23.12.2004 with letter of 21.12.2004

Drawings, Sheets

2/7-7/7	as originally filed
1/7	received on 23.12.2004 with letter of 21.12.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   - ☐ the description, pages:
   - ☐ the claims, Nos.:
   - ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-11
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-11
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-11
	No:	Claims	

2. Citations and explanations

   see separate sheet

Section V:

1. US-A-6 325 180 discloses an electro-mechanical screw actuator according to the preamble of claim 1, in which the satellite gears are accommodated on a flange of an inner ring. The present application seeks to reduce the number of components, which is achieved by providing that the satellite gear wheels are carried directly by the rotor by means of a plurality of axially protruding pins being provided on the rotor.

   These distinguishing features are not known from any of the available prior art documents.

An electro-mechanical screw actuator assembly

The present invention refers to an electro-mechanical screw actuator assembly of the type mentioned in the preamble of claim 1. Such an assembly is known from US 6 325 180 B1.

Actuator assemblies of the above type are known, for example, from US-6 315 092. These actuators are applied in various fields, for example in the automotive field for actuating brakes, friction clutches, gearboxes, etc. An electric motor, mounted within a housing fixable to the vehicle, drives for rotation a nut member of a screw mechanism through a gear reduction system. The screw mechanism comprises a screw connected to a piston actuating head which is imparted a reversible linear motion with a high actuating force.

The object of the present invention is to provide an electro-mechanical screw actuator assembly having few components, of compact dimensions and with a low inertia. Another object of the invention is to provide an actuator assembly particularly well suited for application onto a brake calliper and capable of performing also a parking brake function. A further object of the invention is to provide an electromechanical actuator assembly in which the electric motor is protected from contaminating agents such as grease, dirt and metal particles.

The foregoing, as well as other objects and advantages, that will be better understood herein after, are achieved according to the invention by an electro-mechanical actuator assembly having the features defined in the appended claims.

The constructional and functional features of a few preferred

these two members.

The piston member 70 has a cylindrical surface 73 accommodated with a slight radial play and axially guided within a cylindrical bore 24 of the central tubular portion 21 of the supporting body 20. Preferably, a splined or equivalent coupling 26 is provided at the interface between the bore 24 and the cylindrical surface 73 of the piston to prevent relative rotation between the piston and the stationary parts of the actuator. To this end, also a key coupling may be used.

A threaded locking member 80 is screwed in the outer portion 47 of the sleeve member 45 to axially lock onto the housing 11 the subassembly comprised of the sleeve member 45, the angular contact ball bearing 44 and the nut 61.

When the electric motor 30 is activated, the rotor 34 drives the nut 61 for rotation through the planetary gear reduction system 50. The rotary motion of the nut is converted into a linear translation motion of the screw 62 through the recirculating balls (not shown), causing extension or withdrawal of the piston member 70, according to the direction of rotation imparted by the electric motor.

As will be appreciated, the invention entails the following advantages:

- as the rotor 34 directly carries the satellites of the planetary gear reduction system, there is eliminated a transmission member provided with conventional solutions for transmitting motion from the rotor to other toothed members of the reduction system, and, consequently, the invention attains a reduction of the number of components, a reduction

CLAIMS

1. An electro-mechanical screw actuator assembly, of the type comprising:

an electric motor (30) with a stator (31) and a rotor (34),

a screw mechanism (60), including a rotatable nut (61) and a central screw (62) translatable along a given axis (x),

a planetary gear reduction system (50), disposed between the rotor (34) and the screw mechanism (60) for driving this mechanism, the gear reduction system (50) including a plurality of satellite gears (52);

characterized in that the rotor (34) provides a plurality of axially protruding pins (51) for rotatably supporting the satellite gears (52).

2. An actuator assembly according to claim 1, characterized in that the rotor (34) has an outer peripheral toothing (37).

3. An actuator assembly according to claim 2, characterized in that at least the toothing (37) of the rotor is made of metallic material.

4. An actuator assembly according to claim 2 or 3, characterized in that the toothing (37) is formed as a single piece with the rotor (34).

5. An actuator assembly according to any one of claims 2 to 4, characterized in that the toothing (37) is carried or formed by a peripheral edge of a radial flange (36) of the rotor (34), and that the flange (36) provides said plurality of axially protruding pins (51) for rotatably supporting the satellite gears (52).

6. An actuator assembly according to claim 3, characterized

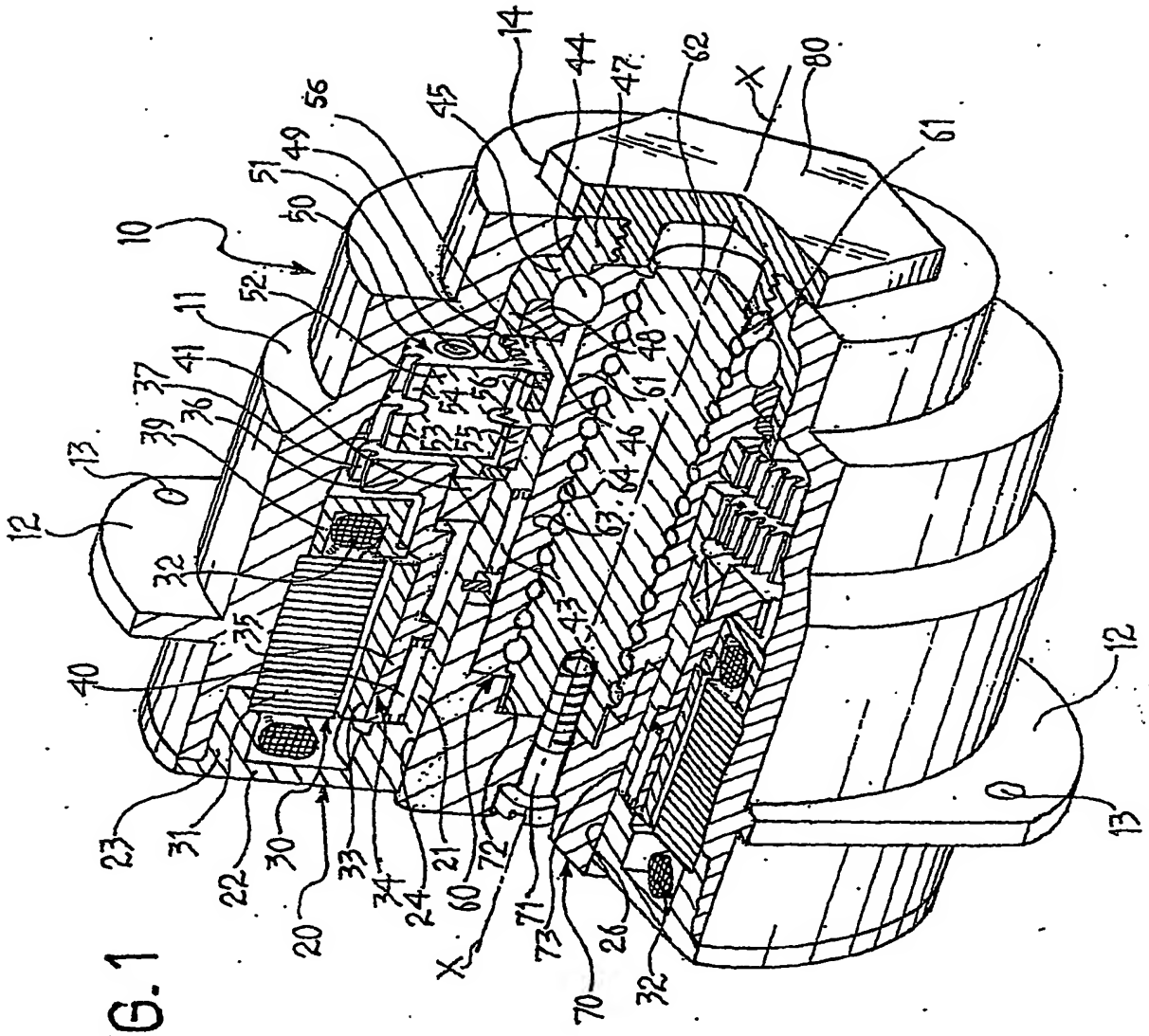
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FIG. 1

Box No. VIII (iii) DECLARATION: ENTITLEMENT TO CLAIM PRIORITY

The declaration must conform to the standardized wording provided for in Section 213; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iii). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51*bis*.1(a)(iii)):

in relation to this international application,

AKTIEBOLAGET SKF is entitled to claim priority of earlier application No. TO2002A001104 by virtue of the following:

(iii) an agreement between SKF INDUSTRIE S.p.A. and AKTIEBOLAGET SKF dated October 09, 2000

(ix) this declaration is made for the purposes of:
(a) all designations

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iii)".